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ABSTRACT

The paper starts with a general description of the Open University's teaching system as it operated in 1976, and student progress through the system. It then analyzes the University's cost structures on the basis of the University's 1976 Recurrent Estimates, and by indicating, on the basis of the information given, estimated average, marginal, and incremental recurrent costs per undergraduate, and shows how average costs per undergraduate will change given various levels of course provision and undergraduate student numbers. Finally, the paper tentatively indicates recurrent costs per Open University graduate. (Author/MSE)

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THE ECONOMICS OF THE OPEN UNIVERSITY OF THE UNITED KINGDOM

Greville W.S.V. Rumble

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THE ECONOMICS OF THE OPEN UNIVERSITY OF THE UNITED KINGDOM

INTRODUCTION

1 The economics of the Open University has been the subject of a number of articles. Wagner (1972, 1973) argued that the Open University has an average cost per full-time-equivalent student one half that of conventional universities. Laidlaw and Layard (1974) attempted to throw light on the direct (instructional) cost of Open University teaching methods as against conventional university methods. Lumsden and Ritchie (1975) have looked at the Open University's cost structures, and examined some of the effects of changing the mix of teaching elements. The aim of this paper is, firstly, to examine the cost structures of the Open University, and project these forward against known plans for expansion; and, secondly, to indicate the average cost per student and per graduate within the Open University.

The Open University's programmes

2 The objects of the University, as stated in its Charter, are "the advancement and dissemination of learning and knowledge by teaching and research by a diversity of means such as broadcasting and technological devices appropriate to higher education, by correspondence tuition, residential courses and seminars, and in other relevant ways, and shall be to provide education of University and professional standards to its students and to promote the educational well-being of the community generally". The University's activities for achieving these objectives fall into four main programmes: (1) undergraduate study; (2) higher degree study; (3) post-experience courses programme; and (4) research.

3 This article is concerned with the University's undergraduate programme and its costs (including the costs of research). The University's higher degree programme is relatively small, with 318 students registered for a higher degree, many of them on a part-time basis. The University's post-experience courses programme offers students the opportunity to take self-contained courses, some of which are also presented in the undergraduate programme. The total number of courses on offer is relatively small (15 in 1976), and the programme is intended to be self-financing in as much as income from fees covers indentifiable costs and makes a contribution towards the overhead costs of the programme.

The undergraduate programme

4 The University's main objectives in its undergraduate programme are firstly to provide students with a minimum range of undergraduate first degree courses, necessary to a degree-awarding institution of higher education, the number of such courses to be such that students who do not want to centre their studies on one particular area can plan a coherent degree programme; and secondly, to educate a large number of students at undergraduate level at a cost to be as economic as possible, consonant with the educational objectives of the University as given above.

5 The University's undergraduate courses are structured on a credit system, each course being either a full credit or a half credit. A full credit course will involve the student in between 32 to 34 weeks' part-time work of from ten to twelve hours per week. Half credit courses involve half this amount of work. There are also some third- and one-sixth-credit modules, which have to be taken together as half credit courses. A student who successfully completes a course accumulates a credit (or half credit) towards the University's degree of Bachelor of Arts (BA) or Bachelor of Arts with Honours (BA Honours). The BA Degree is awarded to a student who obtains six full credits or their equivalent in full and/or half credits. The BA(Honours) Degree is awarded to those students who obtain a total of eight credits. Students may take up to 10 credits, and then choose their best 8 grades towards the classification of the BA(Honours) Degree. Although there are some restrictions on the courses which can be counted towards a degree, such restrictions are kept to a minimum. Thus students are allowed to select the courses which they wish to study with virtually complete freedom of choice from amongst a range of courses offered by the University's six faculties of Arts, Educational Studies, Mathematics, Science, Social Sciences and Technology. Courses are offered at four levels (foundation, second, third and fourth level). There is no foundation course in Educational Studies, and only one such course in each of the other faculties, and students are normally required to complete two foundation courses; additional credits must be obtained at second, third or fourth levels, but candidates intending to work for the BA(Honours) Degree must obtain a minimum of two credits at third or fourth levels.

6 The University awards credit exemptions to students who have successfully completed study at the higher education level, on the basis of one credit exemption per year of full-time study (or its part-time equivalent). The maximum number of exemptions awarded is three credits.

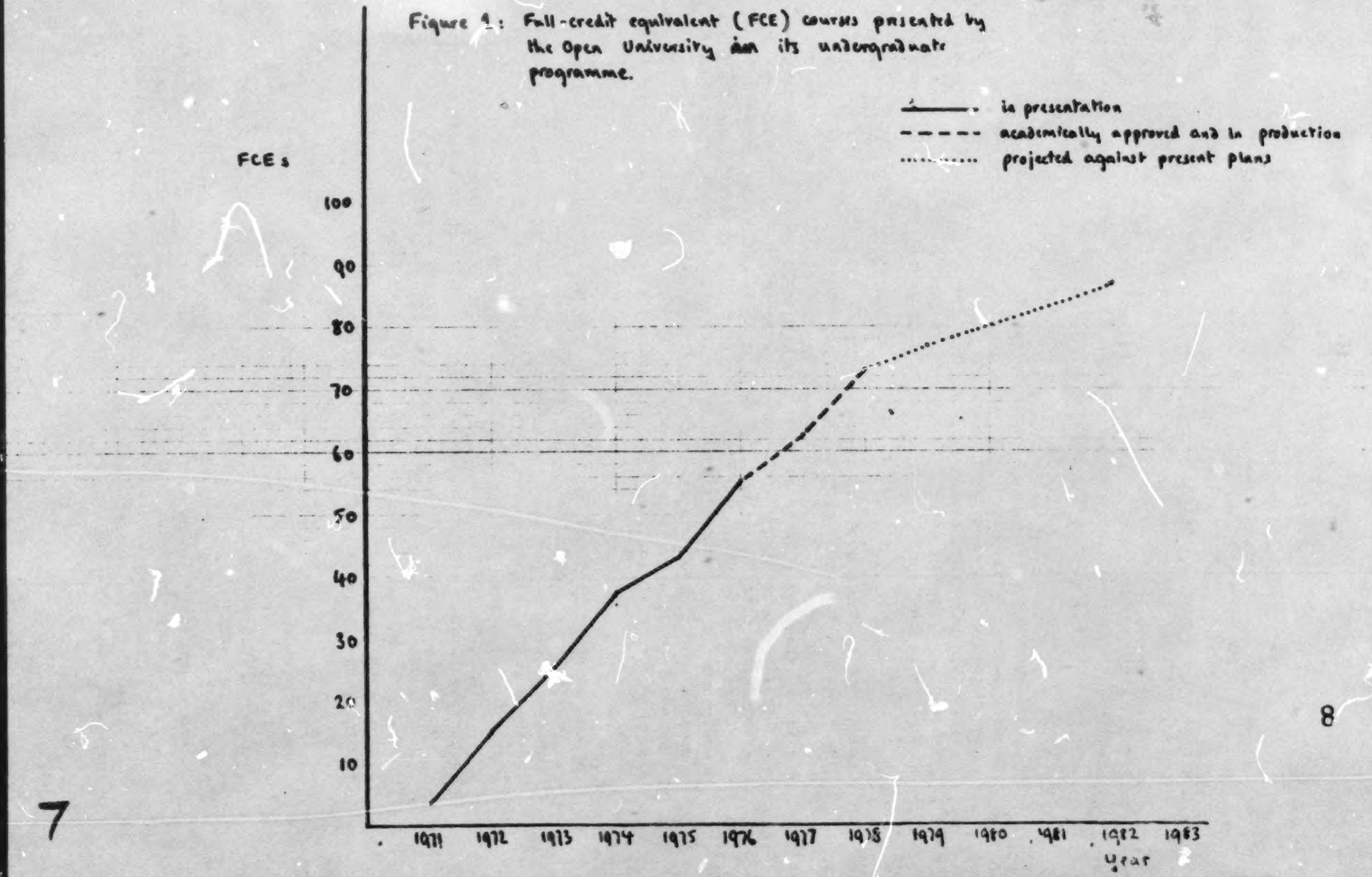
7 The University's present aim is to offer 87 credits at undergraduate level. At the present moment (1976) 95 courses are offered, equivalent to 55.66 credits; and another 12 courses (equivalent to another 7 credits) are in production for presentation in 1977.

8 Figure 1 indicates the planned growth in undergraduate courses up to 1982, when the University hopes to complete its planned undergraduate academic profile.

The teaching system

9 Teaching is done mainly at a distance. At intervals throughout the year course material is sent to the student's home. The materials include correspondence texts, offprints of separately printed extracts from other published material (eg books, articles), ancillary material such as gramephone records and audio-visual material, assignments to be completed by the student, and other supplementary material such as notes on the broadcast elements of the course. Basic reading required of a student on a course, contained in the correspondence texts, is supplemented by prescribed and other recommended reading. Students on certain courses receive 'home experiment kits' which may include a wide range of materials and instruments designed to extend the possibilities of home study. The kit for the Science Foundation Course comprises some 270 pieces of equipment, and provides the students with a 'home-based laboratory'. The kit for the University's second level course The Digital Computer consists of a purpose-built mini-computer (OPUS) designed to teach students the basic principles of computing.

Figure 4: Full-credit equivalent (FCE) courses presented by the Open University in its undergraduate programme.



In 1976 some 35000 kits of 41 different types were despatched to students. Other students make use of the University's Student Computing Services whose terminals are accessible in the University's study centres. Virtually all the University's courses have a broadcast element of television and radio programmes. On average each full credit course or equivalent has 22 radio and the same number of television programmes. These figures nevertheless hide wide variations in the number of programmes allocated to individual courses. Television programmes are of 25 minutes duration, and radio programmes of 20 minutes, and they are broadcast on open air transmission on the national channels of the BBC.

10 Students' work is subject both to continuous assessment and to examination at the end of each course. In addition to self-assessment items built into the correspondence material, students' work is assessed by both constructive response tests, and, in some cases, objective tests. Constructive response tests are of two types: assignments which the student completes at regular intervals throughout his course, and which he sends to a part-time course tutor to be marked; and terminal examinations at the end of the course. In addition some courses make use of computer-marked objective testing, and one course has a computer-marked terminal examination. In no case is the sole method of assessment based upon objective tests. Continuous assessment and examination performance are both taken into account in the award of a course credit to students.

11 Students are attached to a Course Tutor and/or Tutor-Counsellor. These are part-time employees of the University, and in 1976 there are some 5270 of them. Tutor-Counsellors are responsible for both the tuition and counselling of students taking the University's foundation courses, and for the counselling of students taking higher level courses. Course Tutors are responsible for the tuition of students taking post-foundation courses. They mark the students' constructed response assignments, of which there are a minimum of 8 per full credit equivalent course. They also give face-to-face tuition to groups of students; on average there is one Course Tutor to each 20 students, and there is an average of 15 hours of tutorial contact for each group of 20 students on a full-credit course.

12 Students meet their Course Tutors and/or Tutor-Counsellors at one of the University's 260 study centres located throughout the United Kingdom. The organisational framework for managing the regional tutorial and counselling system is provided by thirteen regions, each of which has a Regional Office. The work of these regional offices is co-ordinated and supervised by a central office at the University's main campus at Milton Keynes.

13 Lastly, students on all foundation courses and on certain higher level courses are expected to attend a one week intensive residential course (summer school). These summer schools are mainly held on conventional university campuses, and the students' attendance (where required) is obligatory (although students may be granted excusal from the obligation to attend, or be permitted to defer attendance by one year). In 1976 some 27,000 student summer-school weeks will be catered for. The summer school operation is broadly self-financing, the summer school fee being fixed annually such that it covers expenditure on the overall operation. The 1976 summer school fee is £49 per week, which covers the cost of tuition and of residence.

Course production

14 One of the most important innovations of the Open University has been in the preparation of courses. Each course is prepared by a course team, whose membership and support staff consist of subject content specialists (mainly central academic staff one of whom will be the course team chairman), an educational technologist from the University's Institute of Educational Technology, a BBC producer, a member of regional academic staff (to advise on tutorial aspects), a designer, an editor, a librarian and a course assistant. Course team members can be drawn from different faculties and subject areas. The course team (rather than the individual member) is responsible to the University for the academic quality of the course in all its aspects; for ensuring that material is prepared on time; and for keeping within the budgetary limits laid down. It operates by agreeing the aims of the course, the specific learning objectives to be achieved, and the choice of the appropriate teaching media. Correspondence texts, drafted by individual members of the team or by external consultants, are discussed with other course team members and go through two or more drafts before final approval. In parallel with the drafting of correspondence texts, broadcasts are prepared and recorded, experimental and assignment work designed, teaching arrangements specified, and all components integrated into a total teaching system. The whole process of course development, described by Lewis (1971, 1972, 1973) and Kaye (1973), is usually spread over a period of 18 to 24 months. Once a course is produced it has to be 'maintained' by one or two members of the course team over the academic life of the course. The minimum agreed course life is 4 years, but it is already clear that many courses will have a longer life; the maximum agreed life for a course is 8 years. At the end of its life a course is either remade, or replaced by a totally different course. The degree of 'remake' involved in the individual situation will vary.

STUDENTS

Student throughput at the Open University

15 A number of studies of student progress have now been published, and readers interested in this aspect may wish to consult the articles by Calder and McIntosh (1974 and 1975). For the purposes of this paper, a global approach has been taken to student progress.

16 Tables 1 and 2 give historical data concerning the numbers of finally registered undergraduate students, and the number of graduates produced, per annum. New students are finally registered in April of each year, and for comparative purposes the number of initially registered new students is indicated in parentheses. Continuing students are finally registered in February of each year.(1) The figure for graduates also requires some explanation. Since BA degree graduates (ie those students who have obtained 6 credits) can re-enter the system to obtain additional credits towards the BA(Honours) Degree, those students obtaining a BA(Honours) Degree are effectively counted twice by their additional inclusion in the column giving the number of BA Degree graduates. However, the number of BA(Honours) Degree graduates is an important measure of output since students who have obtained the degree cannot take further credits without re-entering the University as a new applicant.

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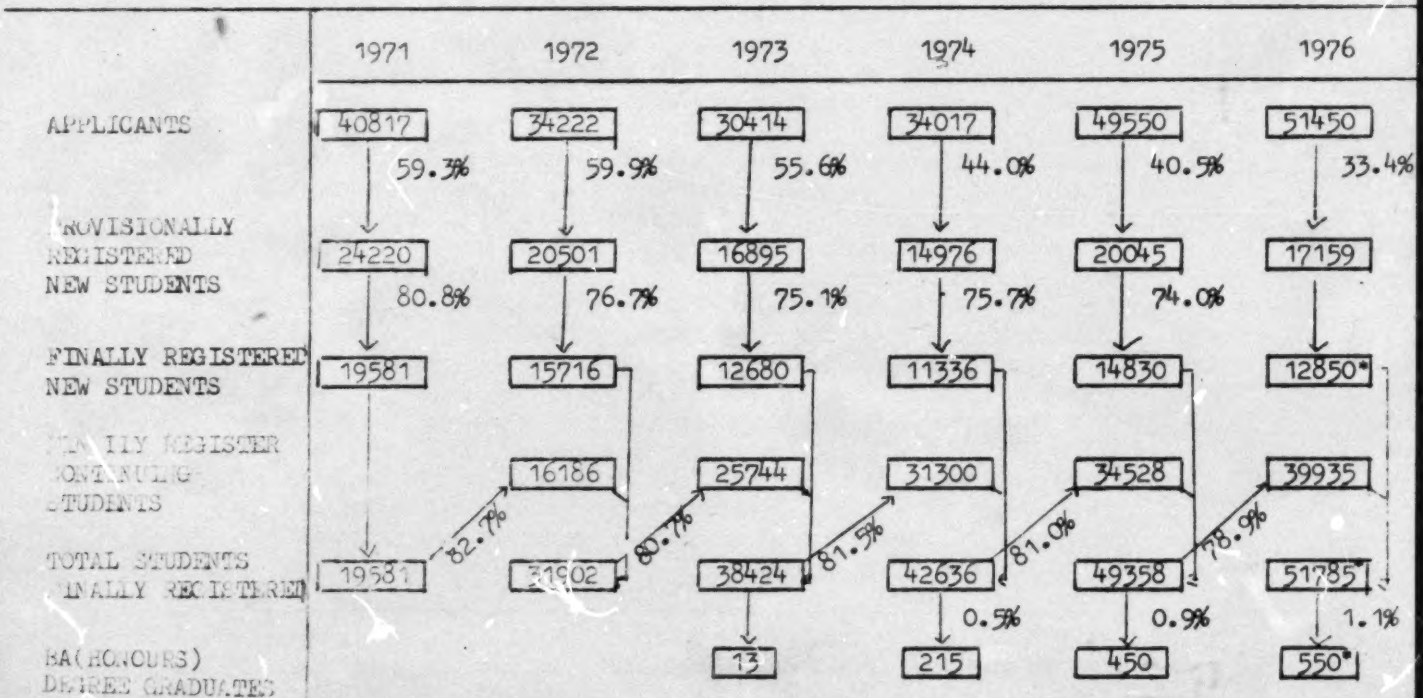
(1) The University's teaching year begins in February, and continues throughout the year until October, when examinations are held.

Table 1: Finally registered undergraduate students, and graduate output, 1971-1976

* estimates

YEAR	FINALLY REGISTERED UNDERGRADUATE STUDENTS BY COHORT						TOTAL	GRADUATES	
	1971 A	1972 B	1973 C	1974 D	1975 E	1976 F		BA Degree	BA(Hons Degree
1971	(24220) 19581						19581	-	-
1972	16186	(20501) 15716					31902	902	-
1973	13354	12390	(16859) 12680				38424	3641	13
1974	10580	10480	10232	(14976) 11336			42636	5180	215
1975	8055	8287	8767	9419	(20045) 14830		49358	5890	450
1976	6110	6483	6686	7905	11751	(17159) 12850*	51785*	6550*	550*

Table 2: Undergraduate student progress and output of BA(Honours) Degree graduates, 1971-1976



* estimates

17 The rate of throughput of undergraduate students in the Open University is a measure of a number of inter-related factors, including:

(a) the number of credits each student takes per year. The maximum number of credits which a student is allowed to take in any one year is 2, but students may take as little as a half credit per year, with the exception of the need to take, if necessary in separate years, 2 full-credit foundation courses. Table 3 shows the theoretical minimum and maximum time which a student might take to obtain a degree (assuming one hundred per cent success rate in the courses taken, and no credit exemptions):

Table 3: Length of time required to take a degree in theory

Degree	Patterns of credits taken	Time taken to obtain degree (in years)
BA	3 x 2 credits per annum	3
BA	1 + 1 + (8 x ½ credit p.a.)	10
BA(Hons)♭	4 x 2 credits per annum	4
BA(Hons)♭	1 + 1 + (12 x ½ credit p.a.)	14
BA(Hons)•	5 x 2 credits per annum	5
BA(Hons)•	1 + 1 + (16 x ½ credit p.a.)	18

Notes: ♭ assumes student takes minimum number of credits (8) required for BA(Honours) degree

• assumes student takes maximum number of credits (10) towards BA(Honours) degree

In fact the ratio of Students: Student Full Credit Equivalent Courses (Students: Student FCEs), which is an indicator of the rate of student throughput, has never declined below a one to one ratio, as Table 4 indicates:

Table 4: Ratio of Students:Student FCEs

1971	1972	1973	1974	1975	1976
1.11	1.17	1.12	1.08	1.05	1.03

(b) the number of credits obtained by students. Although the ratio of students: student FCEs is an important index, it is not the only factor affecting student throughput. An equally important measure is the ratio of Student FCEs: Full Credit Equivalents obtained. Table 5 shows this:

Table 5: Ratio of Student FCEs:FCE credits obtained

	1971	1972	1973	1974	1975
Finally registered student FCE numbers	21715	37658	43206	45949	51542
Credits awarded (in FCEs)	16346	26972	32215	35260	41017
Ratio of Student FCEs: FCE credits awarded	0.75	0.71	0.75	0.77	0.79

Table 5 shows that the ratio of Student FCEs:FCE credits awarded has stayed more or less constant;

(c) the number of credit exemptions awarded students. The Open University's policy of awarding exemptions to students who have successfully completed study at the higher education level (see paragraph 6 above) clearly complicates measurement of potential throughput. Data for all years is not available at present, but Table 6 indicates the number of credit exemptions awarded to finally registered students in the period 1972-1974:

Table 6: Credit exemptions awarded

	1972	1973	1974
Finally registered students	31902	38424	42636
Number of finally registered students having credit exemptions	15514	20313	22358
Number of credit exemptions awarded finally registered students	26284	38763	40634
Average number of credit exemptions awarded per finally registered student	0.82	1.01	0.95

(d) the number of BA(Honours) Degree candidates who proceed beyond the minimum level of 8 credits necessary for the degree, to the maximum of 10 credits (or any intermediate state). Reliable information on this is not as yet available, but future studies will need to take this into account.

Undergraduate student number projections

18 Cost studies indicate the importance of maintaining and if possible increasing student numbers relative to total costs. Open University costs follow the normal relationship between average and incremental (or marginal) cost functions, such that the average cost per student declines with the expansion of student numbers as the cheaper, incremental numbers are included in the total. The significance of this fact for the Open University is brought out in later sections of this paper. Where the Open University differs from conventional (campus-based) universities is that its fixed costs are high and marginal costs low, whereas campus-based universities, by contrast, have low fixed costs but high marginal costs. Laidlaw and Layard (1974) concluded from this that for low levels of operation campus-based universities are the more efficient, and for high levels the Open University system (with a break-even point at some point in between). Figure 2 illustrates the point. Although calculations carried out in this paper are not done on 'real' student number data derived from current projections, present projections are that the University's finally registered undergraduate student population will increase along the lines indicated in Figure 3.

Open University student equivalence to full-time students

19 The Robbins Report (1963, p.108) states that "two part-time students are counted as being equivalent, for costing purposes, to one full-time student". Wagner (1972) adopts this ratio, as do Laidlaw and Layard (1974), but it should be noted that the Robbins Committee offered no rationale for this ratio, and there would appear to be no sound basis for it. Indeed, a much lower ratio (of up to 10:1) is used to equate some part-time further education studies to full-time students.

COST STRUCTURES AT THE OPEN UNIVERSITY

20 The analysis of Open University costs presented in this paper is based on the University's Recurrent Estimates for 1976, expressed at mid-1976 price levels as estimated in December 1975. The direct costs of the University's post-experience courses programme and of its higher degree programme have been separated out. Because these activities are at present marginal to the University's main concern - its undergraduate programme - no attempt has been made to separate out indirect or overhead costs which might be attributable to these programmes. The costs of research, which Wagner (1972) estimated might be equivalent to 10 percent of the University's recurrent budget, can be thought of as an integral part of the overall costs of the University's undergraduate programme, and have therefore not been separated out.

21 Table 7 analyses the University's expenditure into three categories: student-related, course-related and overheads. The attribution of individual budget heads to one of these three categories has not been done in fine detail. However, some justification for the broad categorisations adopted is called for, and the notes which follow are an attempt to provide this.

Figure 2 : Illustrative cost structures at the Open University and at campus-based universities

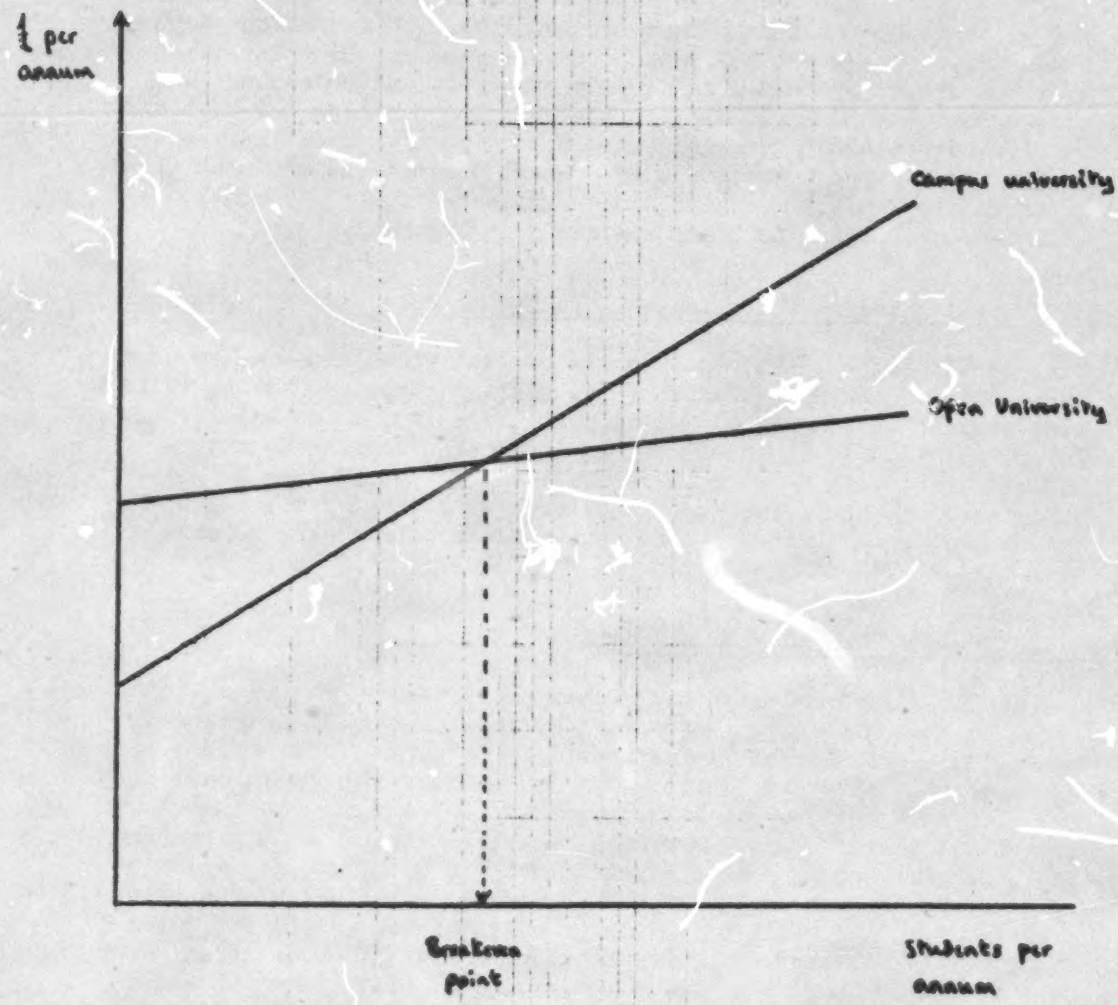


Figure 3 : Finally registered undergraduate student numbers

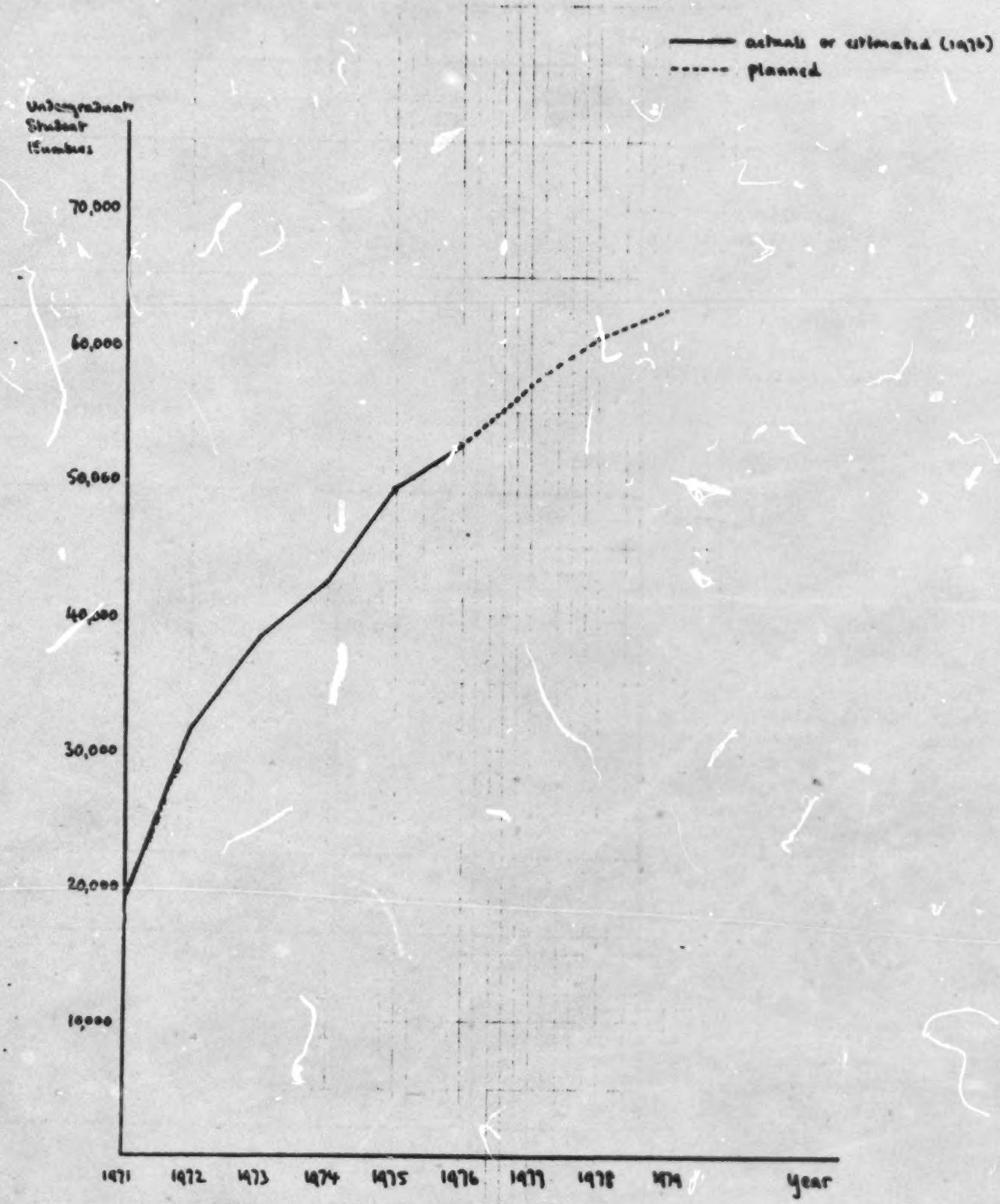


Table 7 : Open University Recurrent Estimates 1976

(£000s at estimated mid-1976 price levels)

	STUDENT-RELATED	COURSE-RELATED	OVERHEADS	TOTAL
CENTRAL ACADEMIC AREAS				
Academic Faculties	289	3,011	119	3,419
Student Computing Service	316	87		403
Institute of Educational Technology	71	293		364
Course Team Budgets		681		681
Sub-total	676	4,072	119	4,867
REGIONAL AND CENTRAL ACADEMIC SUPPORT AREAS				
Operations	256		37	293
Regional Tutorial Services	3,443		242	3,685
Library		294		294
Sub-total	3,699	294	279	4,272
BROADCASTING		1,666	2,008	3,674
ADMINISTRATIVE FUNCTIONS				
Academic Administration, Bursary, Council, Data Processing, Vice-Chancellor's Office	67	40	2,544	2,651
Examinations, Registry, Summer Schools Office	898			898
Administrative expenses (postage and telephone)	400		456	856
	1,365	40	3,000	
Re-allocation	150	150	(300)	
Sub-total	1,515	190	2,700	4,405
INSTITUTIONAL SERVICES				
Capital expenditure ex income, maintenance, rents, research funds, staff/student facilities	766		2,067	2,833
	766		2,067	
Re-allocation	103	103	(206)	
Sub-total	869	103	1,861	2,833
SUMMER SCHOOLS	1,409			1,409
DIRECT STUDENT COSTS	4,689			4,689
TOTAL	12,857	6,325	7,067	26,149

22 The analysis of costs given in Table 7 is broken down into Central Academic Areas, Regional and Central Academic Support Areas, etc.; and the notes below are similarly structured:

(a) Central Academic Areas. The University's six faculties are organisational units to which academic and other support staff are appointed and resources allocated. By far the greater proportion of their expenditure is related to the development, maintenance and remaking of the University's courses. Because the costs of developing these courses is the same irrespective of the number of students who enrol, expenditure is held to be in the main course-related. However, a proportion of the costs related to course maintenance can be said to be student-related, and the salaries of Deans and Sub-Deans are apportioned to overheads.

The Student Computing Service provides a supportive role to those students taking courses which require access to a computer as a part of their studies. The costs of the service are accordingly held to be student-related, with the exception of some costs (such as Post Office line changes), which are course-related.

The Institute of Educational Technology advises on and assists in the design and development of the University's instructional system and initiates, carries out and monitors research on the University as an institution. The greater proportion of this work is related to development and evaluation of courses, and is accordingly held to be course-related. However, the costs of the Institute's Survey Research Department which carries out studies on the student body, are held to be student-related.

Course team budgets cover the costs of graphic and photographic development, fixed print costs and the costs of editing courses. Although the costs are incurred in the University's Operations Area, which has responsibility inter alia for the design, publishing and production of printed course material, these costs are cross-budgeted to course teams, and appear here as course-related costs.

(b) Regional and Academic Support Areas.

The Operations Area also has responsibility for providing a video-cassette copying service and for supporting the technical element in study centres, and for distributing course material. The costs of these activities are held to be student-related. The costs of the Director's Office and Production Office are held to be overheads.

Regional Tutorial Services is responsible for the planning and execution of the University's tutorial and counselling services, for the development of local resources, and for the recruitment, training and supervision of part-time staff. The cost of academic and administrative staff to maintain this system at the University's central campus and in its thirteen regions (with the exception of the Regional Directorate) is held to be student-related. (The actual cost of tuition and counselling is a Direct Student Cost [see below].) The costs of the Regional Directorate are held to be overheads.

The primary role of the Library is to acquire material and to make this available to full-time employees of the University in support of the writing of courses and the pursuit of research. The costs of the Library are held to be course-related.

(c) Broadcasting

The University has a formal Agreement with the BBC, under which the latter provides, at a cost recoverable from the University, production staff, engineering staff and other staff as necessary, together with adequate premises and technical facilities to cooperate with the University's staff in the making of television and radio components of the courses, and subsequently to transmit them. The costs of programme production allowances and of production and related staff are held to be course-related. All other costs are held to be overheads.

(d) Administrative functions

The bulk of student-related expenditure in the administrative areas arises from costs incurred in the Assignments and Examinations Section, Registry (student admission, records and progress) and Summer Schools. A proportion of the costs of the Council Division (student affairs) and of the Vice-Chancellor's Office is also held to be student-related. The cost of the Project Control Office (course production scheduling) is course-related. Postage costs are held to be largely student-related. An arbitrary reallocation of 5 per cent of administrative overheads to each of student-related and course-related costs has also been done, to reflect activities such as administrative and financial support to faculties, courses and student-based areas.

(e) Institutional Services

The greater proportion of costs under institutional services are held to be overheads, although some budget heads are held to be student-related. An arbitrary reallocation of 5 per cent of costs under this head to each of student-related and course-related heads has been made, to reflect support for student facilities, maintenance of faculty and other output related areas, and depreciation of equipment under both heads.

(f) Summer Schools

This covers the cost of tuition and residence at Summer Schools. In practice the University regards expenditure in this area (which is student-related), as being financed from income from students' summer school fees.

(g) Direct Student Costs

Direct student costs, which cover variable print costs, the costs of packaging and mailing of course material, of home experiment kits, audio-visual aids and tuition and counselling, are held to be wholly student-related.

Applicability of present cost structure

23 Unlike the position reported in earlier studies made by Wagner (1972, 1973) and Lumsden and Ritchie (1975), the Open University has now defined limited objectives for its undergraduate programme. Current plans are to offer an academic profile of 87 full credit equivalent (FCE) courses by 1982, although realization of this aim by that date is subject to manpower and funding constraints. The availability of such information allows tentative projections of University costs to be undertaken for the first time. Present cost structures are believed to be applicable in the range 60 to 100 FCEs.

24 The University has no long-term plan which sets a limit on the number of finally registered undergraduate students it might have in the future. Various projections indicate that the University might eventually have as many as about 80,000 undergraduate students. Present cost structures are believed to be applicable in the range 40,000 to 70,000 students, although these limits are not based on any finely drawn studies, and this paper makes no assumptions about changes in cost structures beyond this range.

ECONOMICS OF THE OPEN UNIVERSITY

Limitations of the present study

25 This paper has a number of limitations and these should be briefly noted. Firstly, no detailed analysis has been attempted of the cost of individual courses which the University is actually presenting. Such information is of importance since it has a bearing on decisions to increase the number and mix of courses (as between science-based and arts-based; and between foundation and second level, and third and fourth level courses). A preliminary study in this area was undertaken by Laidlaw and Layard (1974), and a forthcoming study by Wagner (1976) will consider other aspects of this problem in the light of additional information. The importance of such studies can be seen, for example, in the suggestion by Laidlaw and Layard (1974) that higher level Open University courses would have to be justified on the ground that they are an integral part of a system providing wider access to complete degree courses, rather than on the ground that the Open University is a cheap way of providing them. Wagner (1976) will show that as the University expands its number of courses faster than its students numbers, so student numbers per course will drop. In this situation, unless cheaper methods of course production are introduced, an increasing number of Open University courses will be less cost-effective than their conventional counterparts.

The present study does, however, indicate the effect on average recurrent costs per student of increasing the number of courses without a corresponding increase in student numbers.

26 Secondly, the paper is not concerned with the impact on the costs picture of relatively small changes in the production system and the mix of components in the teaching system. Again, this aspect will be explored by Wagner (1976) in some detail. Thirdly, the Open University only pays marginal costs for certain of its activities and does not make a full contribution to overheads. For example, the BBC charges the University only marginal transmission costs for its broadcasts; the University has the use of a large number of study centres at little or no cost; and the University does not have to provide its students with a library service since students are expected to purchase required texts and to rely on public or other libraries to meet their needs. Such factors are of real importance when comparisons are drawn between the costs of the Open University and of conventional institutions. Finally, a large proportion of the Open University's part-time students are in full-time employment, thus contributing to the nation's production and services at the same time as they undertake their studies. No attempt is made to put a value on the social benefits of part-time study.

27 The remainder of this paper is concerned with calculations of:

(a) the average, marginal and incremental costs per equivalent undergraduate student at the present time;

(b) the average recurrent cost per equivalent undergraduate student given future development of the University;

(c) the average recurrent cost per graduate.

Average recurrent cost per undergraduate

28 The average recurrent cost per undergraduate student at the Open University is derived by dividing the total recurrent budget of the University by the number of finally registered undergraduate students. In 1976

$$\frac{\text{Total recurrent budget (£000s)}}{\text{Finally registered undergraduate students}} = \frac{£26,149}{51,785} = £505$$

This is a gross figure, representing the average recurrent cost per undergraduate of the Open University's operations. The actual cost to the Open University, and hence to Government, is about £437. This latter figure is derived by netting out income from fees. (In 1976 total income from fees (both tuition and summer schools) will be of the order of £3.54 millions, or £68 per student.)

Marginal and incremental cost per student

29 Table 7 analysed the cost structure of the University into student-related, course-related and overhead costs. The marginal cost per student, defined as the change in total cost associated with an increase in output of one unit (ie one student) is fairly low - since strictly speaking the only costs which will be incurred in this case will be Direct Student Costs (£90.5 per student) and where applicable summer school accommodation costs (£26). This gives a marginal cost of about £116 per student. However, any sizeable increase in student numbers will require additional administrative and academic support. An incremental

cost per student can be derived by dividing the total number of student-related costs column in Table 7 (£12,857,000) by the total number of finally registered undergraduate students. This gives an incremental cost per student of £248 (gross) or £180 (net of fees). In practice per capita costs of £248 (gross) would only be incurred given a sizeable increase in student numbers (of 20,000 or so). In the short-term, smaller increases in student numbers could be accommodated at a per capita cost somewhere between £116 and £248, depending on the number of additional students involved. Thus the incremental per capita cost of additional students can be regarded as a step function with intermediate steps of cost between £116 and £248, depending on the size of the addition to the student body.

Average marginal and incremental costs per FTE student

30 Using the ratio indicated in paragraph 19, Table 8 gives the average marginal and incremental cost per undergraduate student in the Open University, and the same costs per full-time equivalent student. The figures suggest that the average cost per student per year in the Open University is about one half that of the student in a conventional university. The relatively low ratio of incremental cost to average cost indicates that there are considerable economies of scale to be realized, provided the Open University keeps its course-related and overhead costs constant. If these rise in proportion to or faster than the increase in student numbers, then such economies will not be realized.

Table 8: Average cost per student and per full-time equipalent (FTE) student

	per Open University undergraduate £	per FTE student £
Average cost per student		
(a) gross	505	1010
(b) net	437	874
Marginal cost per student		
(a) gross	116	232
(b) net	48	96
Incremental cost per student		
(a) gross	248	496
(b) net	180	360

Steady state recurrent costs of the Open University

31 Assuming the overhead costs in Table 7 (£6.967 millions) to be fixed, the two variants are firstly, student-related costs, and secondly, course-related costs.

(a) Student-related costs. Present cost structures are believed to hold in the range 40,000 to 70,000 students. This paper assumes that no change in cost structures will occur in the range up to 80,000 students. Current student

number projections are indicated in Figure 3, but these may be varied by the simple expedient of varying the level of intake of new students. For the purpose of this exercise it is enough to assume that student numbers can continue to increase, and subsequent calculations are based on step-increases of 5000 students.

(b) Course related costs. Table 7 indicates total course-related costs of £6.325 millions. These costs are related to the number of credits (58) which it is estimated existing members of the University's central academic staff could maintain and remake in a steady state situation.(1) The additional steady state (incremental) cost of each credit is achieved by dividing the total course-related costs by this figure. This gives a steady state incremental cost/FCE of about £110,000. In other words, the additional steady state cost of achieving the University's interim 1979 target of 77 FCEs is of the order of £2.09 millions, and the cost of achieving the 1982 target of 87 FCEs is of the order of £3.19 millions. These figures need a word of explanation, since they should not be confused with the cost of developing an Open University course de novo.

32 In conventional universities the normal basis for determining academic staffing is the staff:student ratio. However, this is clearly inapplicable in the Open University, and the University has devised its own staffing formula which takes into account its needs to originate, maintain and remake courses over a period of years. In determining academic staffing requirements, the University used essentially objective and easily measurable factors. The basic output is the number of course units produced over the years since 1969 - where a course unit is defined as all the material which serves as the basis for all the learning activities on which the student is expected to spend about 10 to 12 hours of study a week. It therefore covers correspondence texts, ancillary equipment, broadcasts and assignments. The basic input is academic staff time in salaried man years derived from appropriate establishment records, adjusted to take account of study leave, prolonged sickness, work done by consultants, etc.; and also ignoring the time spent by central academic staff in teaching at residential summer schools, since this is not related to the basic output of course units.

33 The historical rates of output, expressed as units/man-year, were then adjusted to take account of the needs of Open University academic staff to undertake research, and planning productivity rates were thus derived for each faculty. These 'productivity' rates vary from 2.5 units/man-

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(1) The University has developed an academic staffing formula for central faculty academic staff. This formula is fully described in paragraphs 33 and 34 below. The total number of courses which existing academic staff could maintain and remake in a steady state situation, while at the same time having time for research, is obtained by applying the formula

$$C = \frac{NP}{0.32(M + R/L)}$$

The terms of this formula are explained in paragraph 34.

year in the Faculty of Arts to 1.4 units/man-year in the faculties of Science and Technology, with intermediate values in the faculties of Social Science (2.3 units/man-year), and Educational Studies and Mathematics (1.6 units/man-year). However, the total manpower requirements of the faculty reflect not only the number of courses and the productivity rate in each faculty, but also the manpower required to maintain courses, the length of life over which courses are maintained, and the manpower required to remake courses at the end of their life. Experience of the manpower requirements of remakes has yet to be acquired, but the University currently plans on the assumption that a course remake will require 50 per cent of the manpower needed to originate it. Similarly planning is based on the assumption that each year a course requires for its maintenance 10 per cent of the manpower needed to originate it.

34 From these assumptions, it has been possible to derive a faculty academic staffing model based on the formula

$$N = \frac{0.32C(M + R/L)}{P}$$

where N = number of faculty academic staff

M = maintenance load as a percentage of the academic staff required to originate a course

R = remake load as a percentage of the academic staff required to originate a course

L = length of life of the course in years

P = the productivity rate

On the basis of currently agreed values for the variables, the formula gives a stead-state staffing requirement of 368 academic staff across all faculties (1). What the formula does not allow for is the cost of attaining the 87 credit academic profile in the first state. Table 9 below illustrates this point very simply for a situation in which the productivity rate is held to be 1.6 units/man-year.

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(1) The total formula-based steady-state manpower requirements in each faculty and for production of 'U' (for University) courses, is as follows:

Undergraduate programme

Academic staffing in the faculties

	ARTS	SOC SCI	ED STUD	MATHS	SCI	TECH	'U' COURSES	TOTAL
C number of courses	16	17	10	10	15	15	4	87
P productivity rate	2.5	2.3	1.6	1.6	1.4	1.4	1.4	
L life of courses	4	4	4	4	4	4	4	
M maintenance load	10	10	10	10	10	10	10	
R remake load	50	50	50	50	50	50	70	
N number of staff needed to maintain undergraduate academic profile	46	53	45	45	77	77	25	368

Table 9: academic manpower requirements in the Open University: the difference between the origination and steady state phases.

Year	Origination (build-up) phase					Steady state (maintenance/remake) phase				
	1	2	3	4	5	6	7	8	9	10
Course A	20	2	2	2	2	(10+2)	2	2	2	2
B		20	2	2	2	2	(10+2)	2	2	2
C			20	2	2	2	2	(10+2)	2	2
D				20	2	2	2	2	(10+2)	2
E					20	2	2	2	2	(10+2)
Total staff	20	22	24	26	28	20	20	20	20	20

35 The man-years required to originate a course (N_o) can be found by dividing the number of course units by the productivity rate, using the formula

$$N_o = \frac{32C}{P}$$

Once made, such courses need to be maintained. The manpower required for this purpose (N_m) can be derived by the formula

$$N_m = \frac{0.32C_mM}{P}$$

where C_m is the number of courses to be maintained. Thus the total man years required in the origination phase can be found by applying the formula

$$\frac{32C}{P} + y_1\left(\frac{0.32C_mM}{P}\right)$$

where y_1 is the number of years courses are maintained. The staffing shortfall required to attain the steady state thus becomes the sum of the formula

$$\left[\frac{32C}{P} + y_1\left(\frac{0.32C_mM}{P}\right)\right] - y_2\left(\frac{0.32C(M + R/L)}{P}\right)$$

In this formula y_2 is the number of years of life which courses are assumed to have. The size of the shortfall is dependent upon the rate of build up of new courses, and hence on the number of years, maintenance required in the origination phase. It should be noted that if a 4 year course life is adopted (ie $y_2 = 4$) the value of y_1 can not be greater than 3. In the example in Table 9, y_2 had a value of 5, and y_1 had a value between 0 and 4, reflecting the rate of build-up. However, if we assume a four year origination and four year steady state period, with maintenance of all courses in the origination phase being spread over three years, then the total requirements of the University in the

origination phase will be 1780 man-years across all faculties, against 1472 man-years over four years in the steady state. The maximum shortfall in man-years is therefore 318, which, at an average cost of £14,500 per academic man-year (including support costs) is equivalent to £4.611 millions. This is not to say that the University cannot achieve the 87 credit profile without this additional manpower. The academic staffing formula is dependent upon a number of variables, and there is some flexibility so that, for example, academic productivity rates are in some faculties higher than the agreed steady state figures, while most faculties have accepted that course lives should be extended beyond the desirable four year life.

36 Additional expenditure on course team budgets will also be incurred in reaching the profile. In 1976 expenditure on Course Team Budgets was £681,000, which was related to the origination and remake of 8 credits of courses, and maintenance of 55.66 credits. Assuming expenditure on maintenance to be 10 per cent that on a new course, then the average course team budget will be:

$(8) + (01. \times 55.66) = £681,000$

$\therefore$ 13.566 credit equivalents = £681,000

$\therefore$ 1 credit equivalent = £50,200

The cost of originating a course <u>de novo</u> is indicated in the note below (1).

37 Similar additional and essentially non-recurrent costs are not, however, likely to arise on other course-related budget heads, where additional costs are truely marginal.

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(1) The cost of originating a course de novo is higher than those figures suggest. Broadly speaking (and again within the context of the Open University and its existing agreement with the BBC) the total cost of originating a course <u>de novo</u> would be of the order of £442,000, made up as follows:

(a) academic staff and support costs, at a weighted university average productivity rate of 1.72 units/man-year, giving 18.6 man-years per FCE, at £14,500 per man-year — £269,800

(b) course team budgets, per FCE — £50,200

(c) broadcasting costs (programme allowances and producers' salaries) at 1.666 millions divided by 300 (annual programme output on each medium), and multiplied by 22 (the average programme allocation per FCE) — £122,200

Steady state costs of the University

38 The steady state recurrent costs of the University can be derived by applying the simple formula

$$E = \alpha S + \beta C + \gamma$$

where E = the total annual recurrent costs of the Open University's undergraduate programme

S = total number of finally registered undergraduate students

C = total number of courses presented in the University's undergraduate programme

and where α, β and γ are variables whose values are determined by dividing total student-related costs (in Table 7) by the number of finally registered undergraduate students; total course-related costs (in Table 7) by the number of credits which it is estimated that present academic staff could maintain and remake in the steady state; and by regarding overheads derived from Table 7 as fixed.

39 The results derived from this formula can be presented in the form of a matrix showing the average (gross) recurrent cost per student for various combinations of student and course numbers. Table 10 shows the results of such an analysis, while Figures 4, 5 and 6 show the effect on average (gross) recurrent costs per student of:

(a) increasing student numbers, while maintaining course numbers at their present level, and with overheads remaining constant (figure 4);

(b) increasing both student and course numbers, with overheads remaining constant (figure 5);

(c) increasing course numbers, while maintaining student numbers at their present level, and with overheads held constant (figure 6).

Table 10: Open University average (gross) recurrent cost per undergraduate given various student and course numbers (£)

courses (in credits) / Students	58	62.66	73.14	77	81	84	87
51785	505	515	537	545	554	560	567
55000	488	499	520	528	536	542	548
60000	468	478	498	504	512	517	523
65000	451	461	478	485	492	497	502
70000	437	445	462	468	474	479	484
75000	424	432	448	453	459	464	468
80000	413	421	435	440	446	450	455

40 These results suggest that economies of scale are possible if student numbers are increased, and that these economies can be made even if course numbers increase to 87 credits, but that this last is only possible given an increase in student numbers. The matrix shows that as the University moves towards achievement of its undergraduate academic profile of 87 credits, so present average costs per student can only be maintained if student numbers increase to approximately 64,400.

Cost per graduate

41 Wagner (1972) pointed out that the advantageous recurrent cost per student enjoyed by the Open University would be of little use if the University produced very few graduates. At the time Wagner was writing, calculations about the Open University's cost per graduate involved a number of problematic assumptions about the future total student population and the annual output of graduates.

42 Such problems still exist to some extent, and this paper must be regarded as a preliminary analysis. The output of graduates depends upon drop-out rates, and the cost per graduating student will also depend upon the rate of throughput of students, which factor is in turn dependent upon the average number of FCEs taken by each student each year, and the pass rate.

Figure 4: Gross average recurrent costs per student assuming fixed course-related and overhead costs

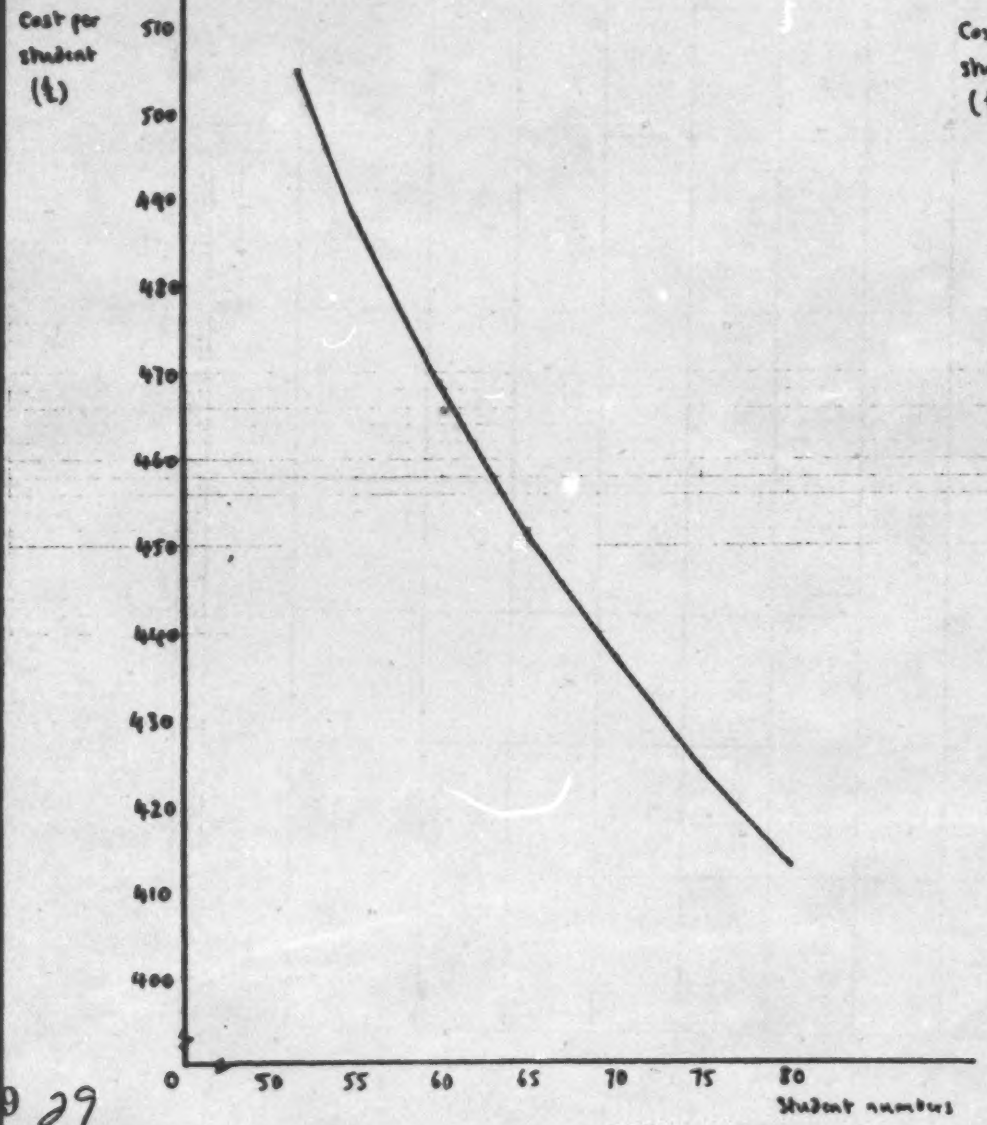
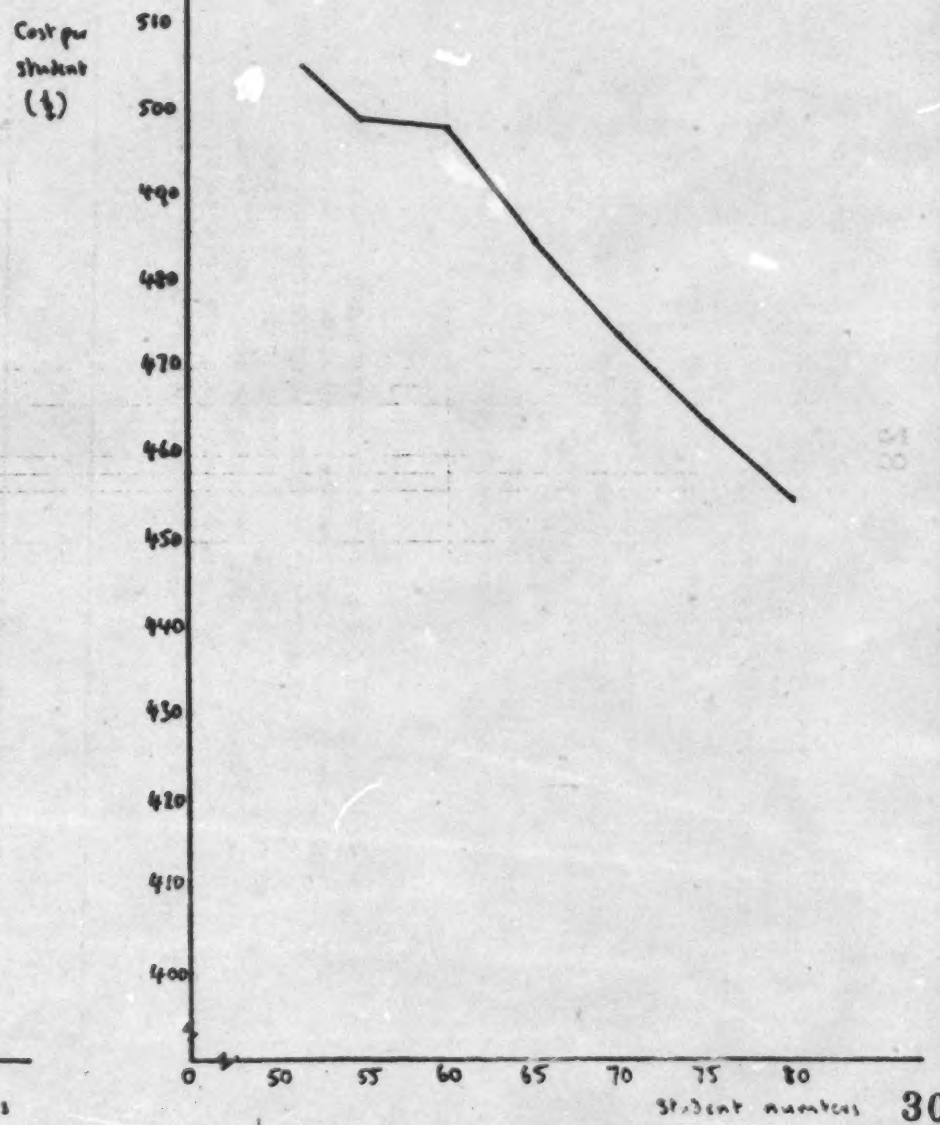


Figure 5: Gross average recurrent costs per student assuming growth in course and student numbers, and fixed overheads



4 The simplest way of arriving at a cost per graduate at the Open University is to assume that the University is in a steady state situation, in which the annual level of intake of new students, and annual level of output of graduates, is constant. The average recurrent cost per graduate is then derived as follows:

$$\frac{\text{Total recurrent budget (£)}}{\text{Number of graduates}} = \text{recurrent cost per graduate in £}$$

Given a recurrent budget of £26.149 millions in 1976, and an estimated steady-state graduate output of 6000, the recurrent cost per BA Degree graduate is £4358. This does not, however, take into account the output of honours graduates in the Open University. Although there is no information as to the proportion of Open University BA Degree graduates who will utlimately proceed to Honours, a reasonable assumption is that 50 per cent will so do. Since Honours graduates are required to take 8 credits as opposed to 6 credits, a weighting of 0.33 might be given them. On this basis, the steady state graduate-equivalent output would be:

(6000 BA degree graduates) + (3000 BA Honours graduates x 0.33) = 6990 graduate equivalents

giving a recurrent cost per graduate-equivalent of £3740.(1)

44 Another approach to the problem is to aggregate the total level of expenditure on the average student by the time he or she graduates. This might be done by the formula

$$R\left[\frac{(C-X)}{FP}\right] = D$$

where D = the recurrent cost per graduate (in £s)
R = the recurrent cost per graduate per annum (in £s)
C = number of credits required for a degree, fixed at 6 credits per BA Degree and 8 credits per BA(Honours) Degree

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(1) Comparisons are always fraught with difficulty. However, a crude comparison can be attempted. The average cost per student at conventional universities (at November 1974 price levels), excluding medicine, was:

Science	Arts	Averagee
£2055	£1410	£1800

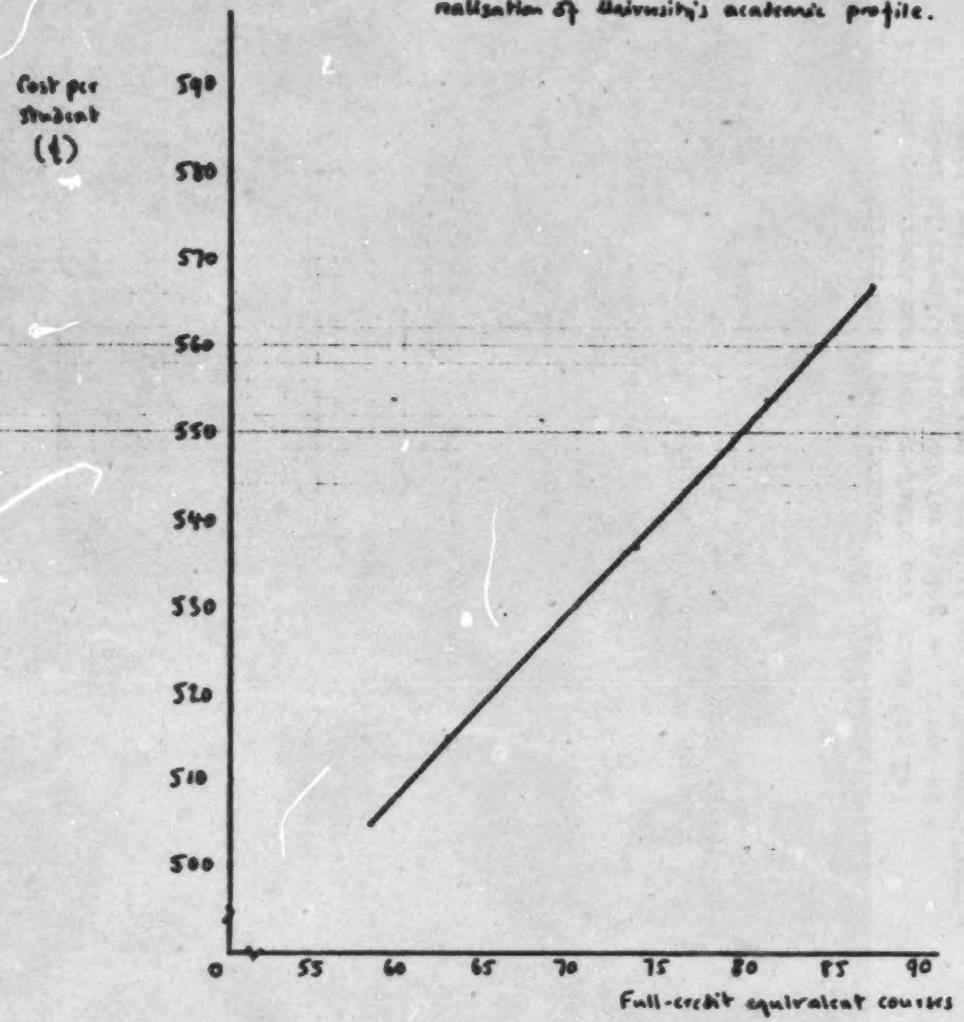
Allowing for price movements from November 1974 to 1 January 1976, using the Brown Index, and assuming a modest 5% increase January to July 1976, brings these costs to

Science	Arts	Average
£2793	£1916	£2446

Assuming a three year degree, and 100 per cent success rate, gives a cost per first degree at a conventional university as follows:

Science	Arts	Average
£8379	£5748	£7338

Figure 6: Gross average increment cost per student assuming fixed student-related and overhead costs, and realization of University's academic profile.



F = the ratio of FCEs per student derived from Table 4.

X = the number of credit exemptions awarded to the average student, derived from Table 6 by dividing the total number of credit exemptions awarded to finally registered students, by the number of finally registered students

P = the pass rate, derived from Table 5 by dividing the total number of FCE credits awarded students by the total number of finally registered FCE students.

The expression $\left[\frac{(C-X)}{FP}\right]$ gives the average number of years a student will take to obtain a degree (BA or BA(Honours) as appropriate), and multiplication by the average recurrent cost per student per year gives an average recurrent cost per graduate.

45 This gives the following values for the formulae where C is equal to six credits for a BA Degree:

$$505\left[\frac{(6.0 - 0.94)}{(1.03)(0.76)}\right] = £3264$$

and where C is equal to eight credits for a BA(Honours) Degree:

$$505\left[\frac{(8.0 - 0.94)}{(1.03)(0.76)}\right] = £4555$$

These results are comparable with the figure given in paragraph 44.

46 Figures 7 and 8 show the effect on the cost per graduate of a change in the student:student FCE ratio, and of a change in the pass rate, and figure 9 shows the cost per graduate resulting from changes in the average cost per student per annum.

47 However, since the University's policy of awarding credit exemptions to suitably qualified students in effect reduces the cost to the University of educating a student to degree level, it is instructive to compare these figures with the cost per graduate if no credit exemptions were awarded. The corresponding figures would then be £3870 for a BA Degree graduate, and £5161 for a BA(Honours) Degree graduate. These figures compare favourably with the costs of producing a graduate in a conventional British university (see footnote (1) on page 29), being of the order of 45 to 65 per cent of the conventional cost. Clearly the average number of credit exemptions awarded students affects the cost per graduate, as figure 10 shows. This figure also shows the affect on the cost per Honours graduate if students were to progress beyond 8 credits to the maximum of 10 credits allowed under the University's regulations, in comparison with the cost where students are awarded credit exemptions (to the maximum of 3).

Figure 7 : Effect on the recurrent cost per graduate derived from the formula $D = R\left[\frac{(C-X)}{FP}\right]$ given a change in the value of the variable F (Student : Student FCE ratio), where R = £505 ; (C-X) = 7.06 ; and P = 0.76.

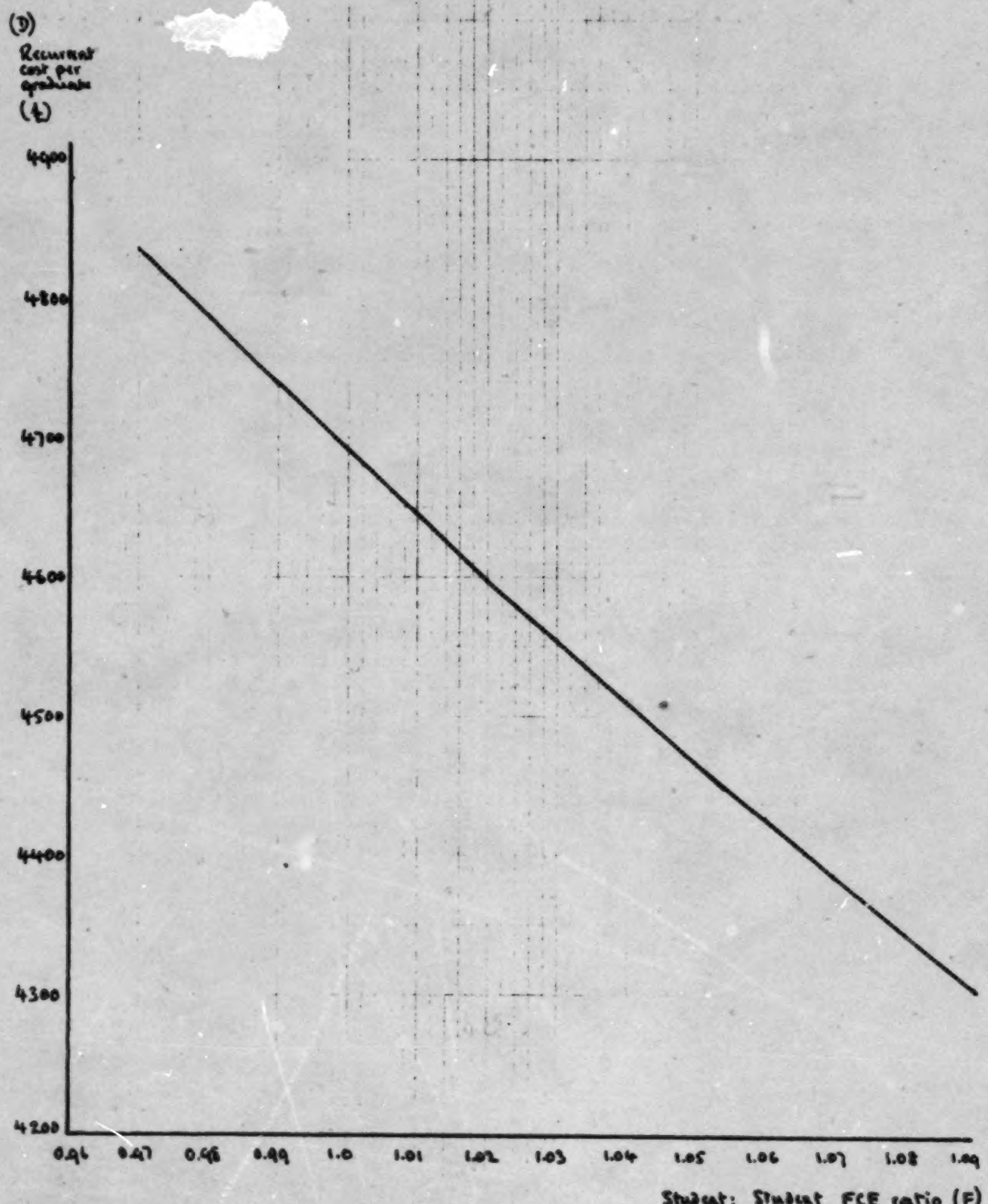


Figure 8: Effect on the recurrent cost per graduate derived from the formula $D = R\left[\frac{(C-X)}{FP}\right]$ given a change in the value of the variable P (Pass rate), when R = £505; (C-X) = 7.06; and F = 1.03.

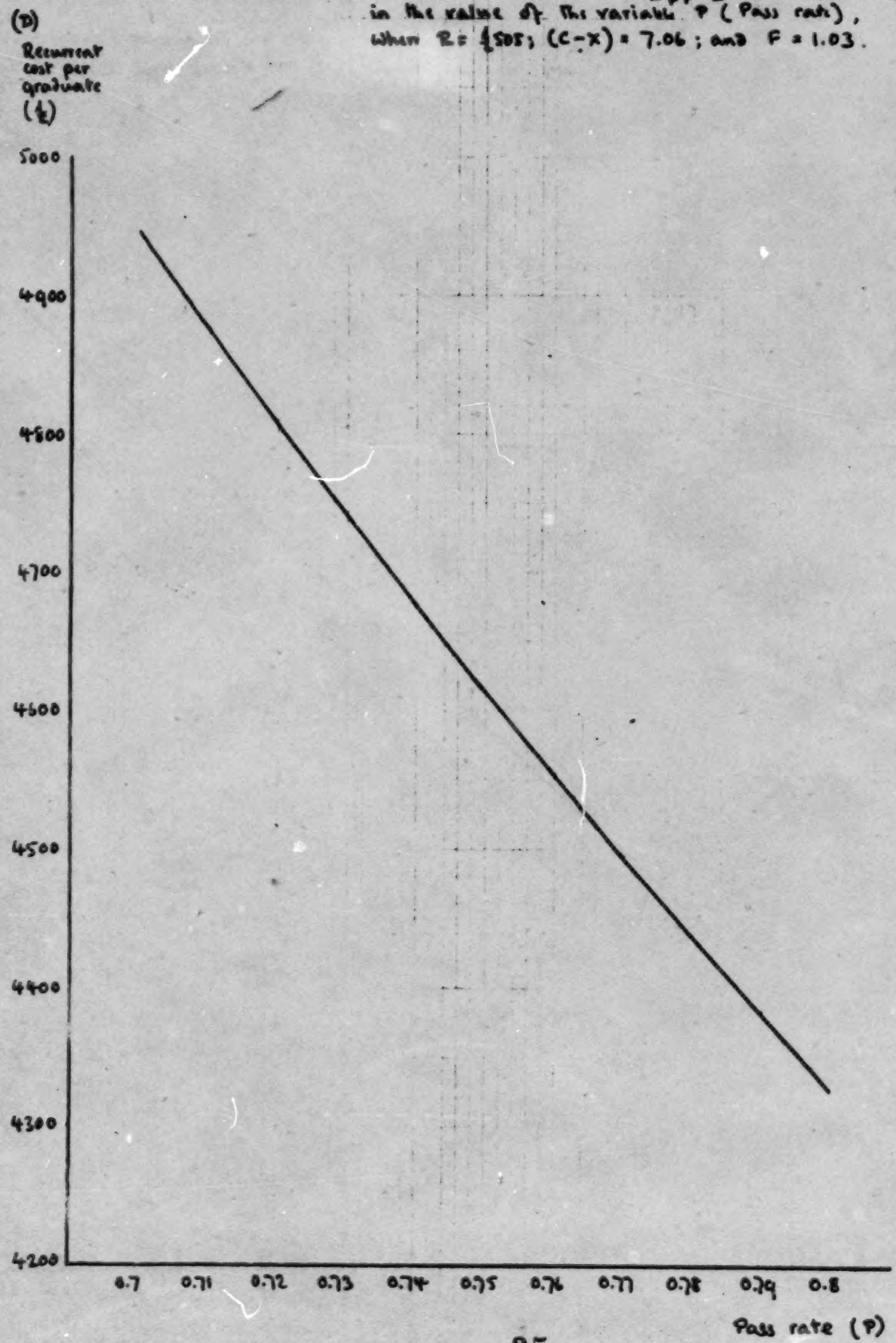


Figure 9: Recurrent cost per graduate derived from the formula $D = \frac{R[(C-X)]}{F \cdot P}$ where the value of the variable R (average recurrent cost per student per annum) varies, and where $(C-X) = 7.06$, $F = 1.03$ and $P = 0.76$

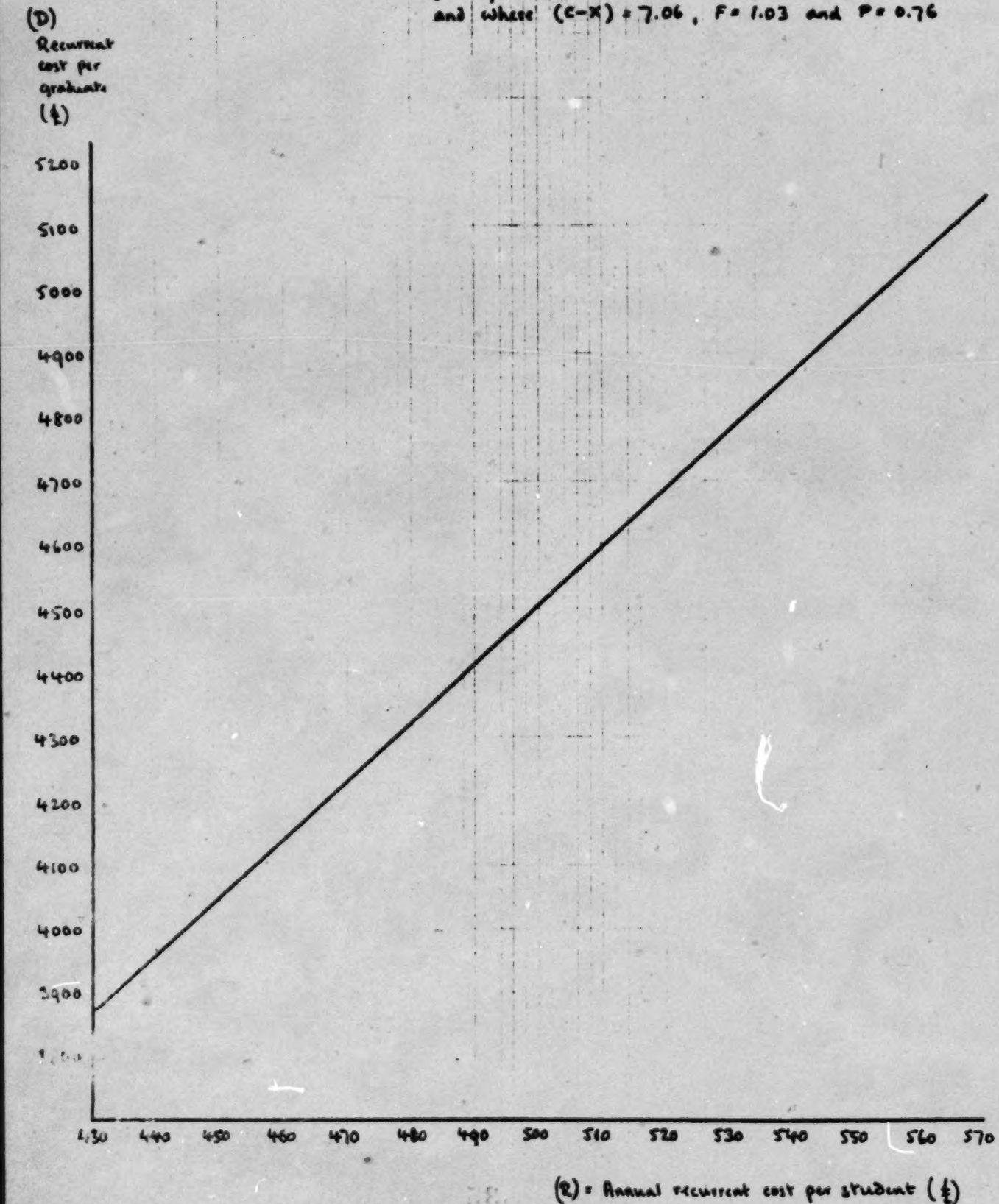
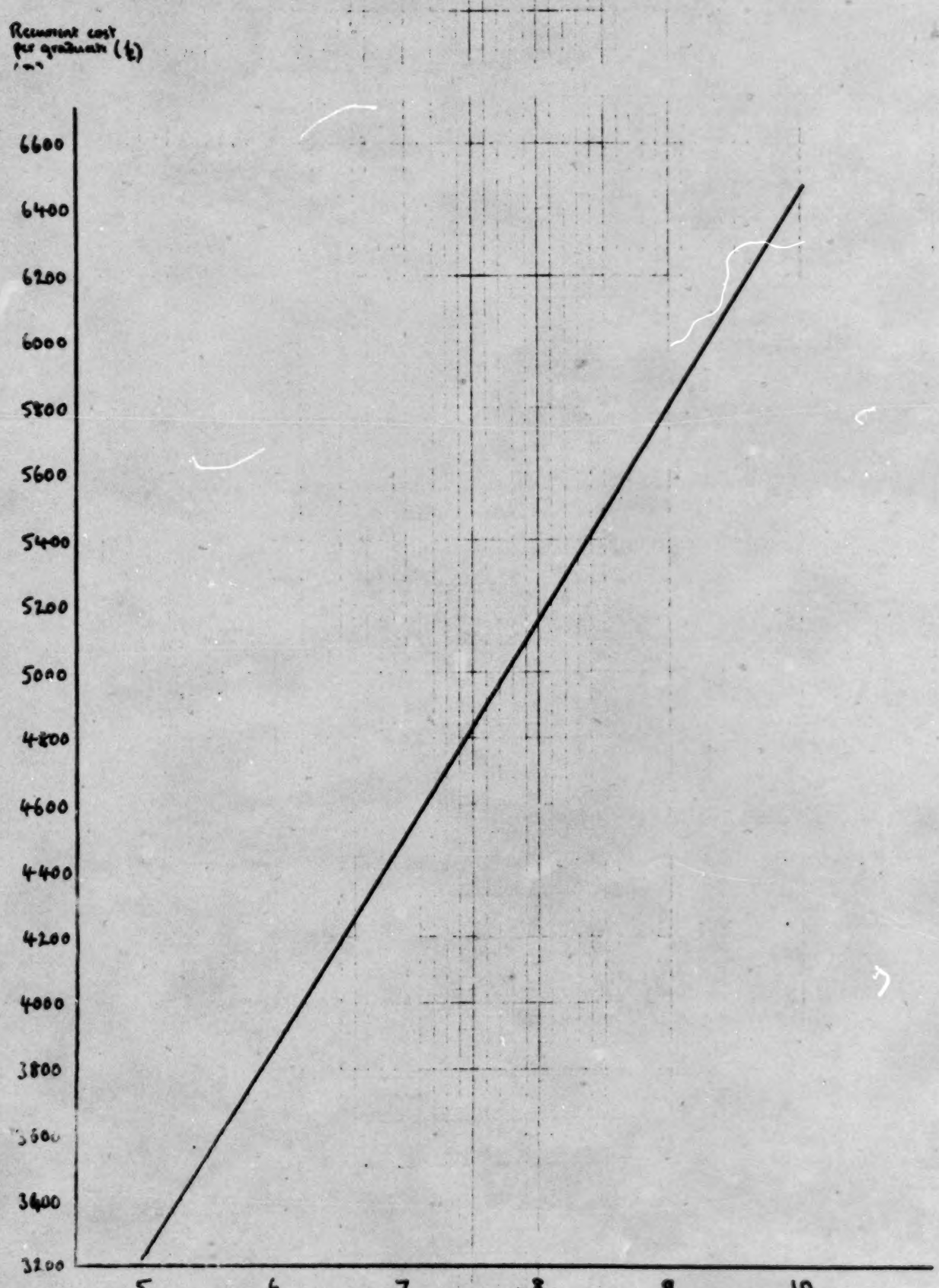


Figure 10 : Recurrent cost per graduate derived from the formula $D = R\left[\frac{(C-X)}{F^{P}}\right]$ where $R = £505$; $F = 1.03$; $P = 0.76$, and the value of $(C-X)$ varies



SELECT BIBLIOGRAPHY

Bates, A W (1975), Student Use of Open University Broadcasting (The Open University, mimeo)

Calder, J and McIntosh, N E (1974), 'Student drop-out, wastage and withdrawal', Higher Education Review (Autumn 1974)

Calder, J and McIntosh N E (1975), A Degree of Difference (The Open University, mimeo)

Carter, C F (1973), 'The economics of the Open University: a comment' Higher Education 2 (1973)

Committee on Higher Education under the Chairmanship of Lord Robbins (1963), Cmnd 2267 (The Robbins Report), Appendix (October)

Hawkridge, D G (1975), The Open University: a select bibliography (The Open University, mimeo)

Kaye, A R (1973) 'The design and evaluation of Science courses at the Open University', Instructional Science 2 (1973)

Laidlaw, B and Layard, R (1974), 'Traditional versus Open University teaching methods, a cost comparison', Higher Education 3 (1974)

Lewis, B N (1971, 1972, 1973), 'Course production at the Open University', British Journal of Educational Technology; Vol 2, Nos 1, 2 and 3 (1971); vol 3, No 2 (1972) and vol 3, no 4 (1973).

Lumsden, K G and Ritchie, C (1975), 'The Open University: a survey and economic analysis', Instructional Science 4 (1975)

McIntosh. N E (1972), 'Research for a new institution - the Open University', in Innovations in Higher Education (London, Society for Research in Higher Education, 1972)

McIntosh, N E (1975), 'Open admission - an open door or a revolving door?' Universities Quarterly (March 1975)

McIntosh, N E and Woodley, A (1974), 'The Open University and the second chance education', Paedogogica Europaea, 9 (June, 1974)

McIntosh, N E and Woodley, A (1975), Excellence, Equality and the Open University (The Open University, mimeo)

The Open University (1976), An Introduction to the Open University (The Open University, Information Services)

The Open University, Annual Digest of Statistics, 1975

The Open University (1975), BA Degree Handbook 1976

The Open University (1976), Courses Handbook 1976

The Open University (1975), Guide for applicants for undergraduate courses 1977

The Open University (1975), Post-experience Courses Prospectus 1976

The Open University (1975), Postgraduate Prospectus 1976

Perry, Sir Walter (1972), The early development of the Open University: Report of the Vice-Chancellor, January 1969 - December 1970 (The Open University)

Perry, Sir Walter (1973), The first teaching year of the Open University: Report of the Vice-Chancellor 1971 (The Open University)

Perry, Sir Walter (1973), The Open University: Report of the Vice-Chancellor, 1972 (The Open University)

Perry, Sir Walter (1975), The Open University: Report of the Vice-Chancellor, 1973, (The Open University)

Perry, Sir Walter (1974), The Open University: Report of the Vice-Chancellor, 1974 (The Open University)

Planning Committee (1969), Report of the Planning Committee for the Open University to the Secretary of State for Education and Science (London HMSO 1969)

Tunstall, J (1974), The Open University Opens (London, Routledge and Kegan Paul, 1974)

Wagner, L (1972), 'The economics of the Open University: Higher Education 2 (May 1972)

Wagner, L (1973), 'The economics of the Open University: a reply', Higher Education 2 (1973)

Wagner, L (1973), 'The Open University and the costs of expanding higher education', Universities Quarterly (Autumn 1973)

Wagner, L (1976, forthcoming) 'The economics of the Open University revisited'.